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㊹発明の名称　水冷爆発管

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明　細　書

1．発明の名称

水　冷　爆　発　管

2．特許請求の範囲

(1) 一端の閉塞した内管を一端の閉塞した外管内に挿入して上記内管と外管とで形成される空隙を水密閉式に設け、上記空隙内にその他端部から給水管を挿入して一端部で開口し、さらに上記他端部に排水口を設け、内管内に火薬を設置してなることを特徴とする水冷爆発管。

3．発明の詳細な説明

〔産業上の利用分野〕

本発明は高温場所における爆発作業に用いる爆発管に関し、特に溶鉱炉の改修の際の発破作業に好適に使用できるものである。

〔従来の技術及び発明が解決しようとする課題〕

従来から溶鉱炉においては、連続操業の結果内部にカーボン、鉄鉱石、金属類等が固着するので定期的な改修作業が必要である。そしてこの改修の際に、その解体作業中に上記固着物を発破にて除去する作業が実施される。

この発破作業は高温下で実施されるため、火薬を常時冷却しながらこれを所定の箇所に設置しなければならない。そこで従来下記のような水冷爆発管が用いられている。即ち第2図に示すように一端が閉塞した外管(3')内に、一端の上部を開口し、他端を給水管(6)に連通した内管(5')を挿入し、さらに該内管(5')内に火薬(9)を充填した薬筒(10)を設置したものや、第3図に示すように一端が閉塞した単管(11)内に開放端から補助棒(12)により火薬(9)を先端部分まで挿入して開放端を水ホース(13)を取り付けた布栓(14)で塞いでなるものがある。なお図中(15)は脚線を示す。

しかしながら前者の爆発管は、外管、内管及び薬筒の3層構造であるため火薬の充填量が少なく、また排水が開放方式であるために高温箇所に設置すると多量の蒸気が発生したり、外管と内管との空隙全体に水が十分回らない等の問題がある。そして後者の爆発管は、単管パイプ

のみの構成であるので安価であるが、火薬が管に直接当たり、また排水が開放方式であるため上記と同様に蒸気発生の問題や、水を管全体に回すためには多量の水を必要とし、さらに温度管理ができないといった問題もある。

〔課題を解決するための手段〕

本発明はこれに鑑み種々検討の結果、従来の水冷爆発管の問題点を改善したものである。

即ち本発明は、一端の閉塞した内管を一端の閉塞した外管内に装入して上記内管と外管とで形成される空隙を水密閉式に設け、上記空隙内にその他端部から給水管を装入して一端部で開口し、さらに上記他端部に排水口を設け、内管内に火薬を設置してなることを特徴とするものである。

〔実施例〕

次に本発明を一実施例にて説明する。

第1図（イ）(ロ）に示すように、一端を閉塞し他端部に内部と連通する2個の排水口(1)を設け、他端の開放口の周縁にフランジ(2)を取り付けた外管(3)内に、同じく一端を閉塞して他端の開放口の周縁に上記フランジ(2)との相フランジ(4)を取付けた内管(5)を装入して両方のフランジ(2)(4)をOリングを介在させてボルト止めした。さらに上記内管(5)の外面には、上記相フランジ(4)を貫通して上記一端部まで延設して該一端部で開口した2本の給水管(6)を固定した。そして上記内管(5)の内部に他端の開放口から火薬を挿入設置して水冷爆発管を構成した。なお図中(7)は内管(5)のずれ止めである。そしてこのずれ止め(7)は給水管(6)と相互に直角の位置の内管外面に固定すれば、給水管(6)も同様に内管(5)のずれを止めるのに役立つ。

この水冷爆発管は給水管(6)から水を供給し、これを排水口(1)から排出した状態で所定の場所に設置して使用するものである。

上記水冷爆発管の特徴としては、内管と外管とで形成される空隙(8)を給水管(6)と排水口(1)を除いて水密構造とした点にある。

従ってこのような爆発管は、排水口より水を回収できるため高温使用環境での蒸気の発生を防ぐことができ、さらに給水管から供給する水は上記空隙(8)全体に十分回すことが可能となる。また2層構造であるため内管内に一杯に装填する火薬の量は、従来の3層構造のものと比べて大きくアップする。そして排水温度や内管温度の測定により確実に温度管理ができ、さらに供給水量により温度の調節が可能である。また上記従来の爆発管に比べて使用する水の量が最も少なくて済む。

なお上記実施例では給水管(6)を2本設けたがこれは1本でもよい。また排水口(1)は上側の1箇所だけでもよい。

〔発明の効果〕

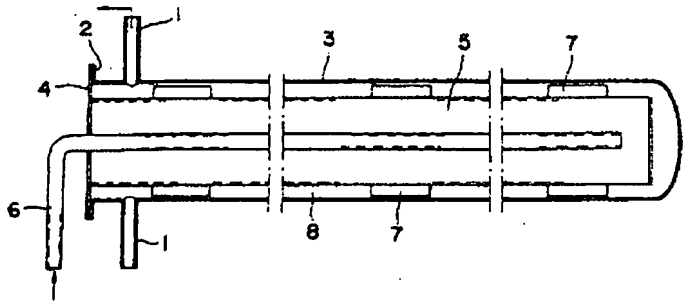
このように本発明によれば、従来に比べて、蒸気の発生がないので作業上安全で、かつ温度調節が可能で、さらに使用水量が少ない等実用上顕著な効果を奏する。

4．図面の簡単な説明

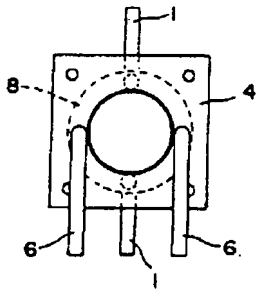
第1図（イ）(ロ）は本発明の一実施例を示すもので（イ）は要部側断面図、（ロ）は正面図、第2図及び第3図は従来例を示すものでそれぞれ側断面図である。

1…排水口
2…フランジ
3…外管
4…相フランジ
5…内管
6…給水管
7…ずれ止め
8…空隙
9…火薬
10…装薬
11…単管
12…補助棒
13…水ホース
14…布栓
15…銅線

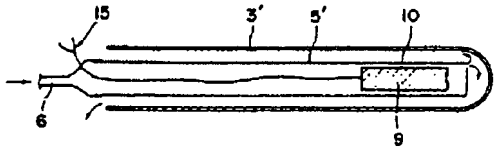
第1図(イ)



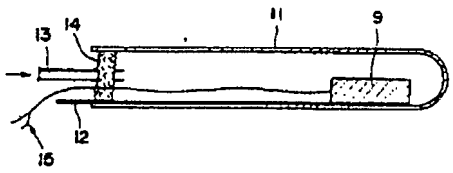
第1図(ロ)



第2図



第3図



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(54) **Water Cooled Explosive Tube**

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SPECIFICATION

1. Title of the Invention

Water-cooled Explosion Tube

2. Claims

(1) A water-cooled explosion tube characterized in that an inner tube having one end closed is inserted into an outer tube having one end closed, an air gap formed between the inner and outer tubes is a water-tight structure, a water supplying pipe having one end opened is inserted from its other end into the air gap, a drain is provided at said other end, and explosive is set in the inner tube.

3. Detailed Description of the Invention

[Industrial Field of Utilization]

The present invention relates to an explosion tube used in a blasting operation at a high-temperature place and more particularly, used optimally in a blasting operation at the time of renovation of a blast furnace.

[Prior Art and Problems that the Invention is to solve]

Conventionally, in operation of a blast furnace, as a result of continuous operations thereof, since carbon, powder ore, metal and the like are firmly fixed to its inside, a regular renovating operation is necessary. At the time of the renovation, an operation for removing the above fixed material by blasting is performed during its demolition work.

Since this blasting operation is performed under a high

temperature, explosive has to be set at a predetermined position while it is always cooled down. Thus, conventionally, a water-cooled explosion tube, which will be described later, is used. More specifically, as shown in Fig. 2, an inner tube (5') having one end whose upper side is opened and other end connected to a water supplying pipe (6) is inserted into an outer tube (3') having one end closed and a cartridge (10) filled with explosive (9) is set in the inner tube (5'), or as shown in Fig. 3, explosive (9) is inserted by an auxiliary rod (12) from its open end into a single tube (11) having one end closed to its edge portion and the open end is blocked with a cloth plug (14) to which a water hose (13) is attached. In addition, reference numeral (15) in the figure designates a detonator wire.

However, according to the former explosion tube, since it is a three-layer structure comprising the outer tube, the inner tube and the cartridge, an amount of explosive to be filled is small. In addition, since the discharging system is opened, when it is set at a high-temperature place, a large amount of vapor is generated or water does not sufficiently circulate around the whole air gap between the outer and inner tubes, which are problems. Furthermore, according to the latter explosion tube, since it is a single-tube structure, it is inexpensive. However, the explosive is directly in contact with the tube. In addition, since the water discharging system

is also opened, as described above, the vapor is generated, a large amount of water is necessary to circulate around the whole tube and the temperature cannot be controlled, which are also problems.

[Means for Solving the Problems]

The present invention was made in view of the above problems to improve the conventional water-cooled explosion tube after various kinds of studies.

More specifically, the present invention is characterized in that an inner tube having one end closed is inserted into an outer tube having one end closed, an air gap formed between the inner and outer tubes is made to be water-tight structure, a water supplying pipe having one open end is inserted from the other end into the air gap, a drain is provided at the other end, and explosive is set in the inner tube.

[Embodiment]

An embodiment of the present invention will be described.

As shown in Fig. 1 (a) and Fig.1 (b), into an outer tube (3) whose one end is closed, the other end is provided with two drains (1) connected to the inside and a flange (2) is attached to the other open end, an inner tube (5) whose one end is closed and a companion flange (4) with the flange (2) is attached to the other open end is inserted, and both of the flanges (2) and (4) are bolted through an O ring. Two water supplying pipes

(6) penetrating the companion flange (4), extending up to the one end and being opened at their ends, are fixed to an outer surface of the inner tube (5). Explosive is inserted from the open end to the inside of the inner tube (5) to constitute a water-cooled explosion tube. In addition, reference numeral (7) designates a ribband of the inner tube (5). If the ribband (7) is fixed to the outer surface of the inner tube in the position perpendicular to the water-supplying pipe (6), the water-supplying pipe (6) also prevents slippage of the inner tuber (5).

The water-cooled explosion tube is set at a predetermined place and used in the state where it supplies water from the water supplying pipes (6) and discharges the water from the drains (1).

The water-cooled explosion tube is characterized in that an air gap (8) formed between the inner and outer tubes is of a watertight structure except for the water supplying tubes (6) and the drains (1).

Therefore, according to such an explosion tube, since water is collected by the drains, vapor is prevented from generating in a high-temperature environment. Furthermore, the water supplied from the water supplying pipes can sufficiently circulate around the whole air gap (8). In addition, since it is a double layer system, an amount of explosive filled in the inner tube is largely increased as

compared with the conventional three-layer structure. Still further, a temperature can be surely controlled by measuring temperatures of the discharged water and the inner tube, and the temperature can be adjusted by controlling the amount of the supplying water. In addition, an amount of water used is the least as compared with the conventional explosion tube.

Besides, although there are two water-supplying tubes (6) in the above embodiment of the present invention, one tube may be provided. In addition, the drain (1) may be provided only at an upper portion.

[Effects of the Invention]

Thus, according to the present invention, as compared with a conventional case, there can be provided several effects in practice, for example, since there is no vapor generation, a working operation is safe, the temperature is adjustable and the water consumption is small.

4 Brief Descriptions of the Drawings

Fig. 1 (a) and Fig.1 (b) illustrate an embodiment of the present invention, in which Fig. 1(a) is a side sectional view showing a substantial part and Fig. 1(b) is a front view thereof, and Figs. 2 and 3 are side sectional views showing the conventional examples.

1: Drain

2: Flange

3: Outer tube

4: Companion flange

5: Inner tube

6: Water supplying pipe

7: Ribband

8: Air gap

9: Explosive

10: Cartridge

11: Single tube

12: Auxiliary rod

13: Water hose

14: Cloth plug

15: Detonator wire